Prep Questions for Exam #3: Answers

1. *Briefly discuss two ways the Federal Reserve is independent from the President and Congress. Despite the Fed's high degree of independence, how can the President and Congress influence the Fed?*

   The Fed's independence is enhanced because 1) it makes a profit from its operations, so it does not need Congressional appropriations; and 2) The General Accounting Office cannot audit either the Fed's monetary policy operations or its foreign exchange market functions. The President and Congress can influence the Fed 1) by passing legislation to take away power from the Fed, and 2) with the Presidential power to appoint Governors to the Federal Reserve Board.

2. *Compare and contrast the Federal Reserve and the European Central Bank? How are the National Central Banks different from the Federal Reserve Banks? Which central bank is more independent and why?*

   The Federal Reserve's powers can be changed through legislation while the European Central Banks powers can only be changed by signing a new treaty. Since it is much harder to negotiate a new treaty than to pass new legislation, the European Central Bank is considered to be more independent than the Federal Reserve.

3. *Suppose the Federal Reserve purchases $35 million in bonds. If the currency-to-deposit ratio is 0.20 and the reserves-to-deposit ratio is 0.15, then how much does the money supply change?*

$$\Delta M^S = [(1+c)/(rr+c)] \times \Delta M^B$$
$$\Delta M^S = [(1+0.20)/(0.15+0.20)] \times 35$$
$$\Delta M^S = [1.20/0.35] \times 35$$
$$\Delta M^S = \$120 \text{ million}$$

4. *State the assets and liabilities of the Fed. Use a T-account to show how the Fed's balance sheet changes when it purchases $2.5 million in bonds. Use a T-account to show how the Fed's balance sheet changes when it provides a $1 million loan of reserves to First National Bank?*

The Fed purchases $2.5 million in bonds.

The Fed's Balance Sheet

Assets		Liabilities	
Securities	+ $2.5	Reserves	+ $2.5

The Fed provides a $1 million loan to FNB.

The Fed's Balance Sheet

Assets		Liabilities	
Loans	+ $1	Reserves	+ $1

5. *Name the four ways the money supply can increase? For each way, does the Fed, banks, or the public make the decision?*

   a. Open market purchases increase reserves, which push up the money supply. The Fed makes this decision.

   b. Banks borrow more reserves from the Fed, which raises the money supply. Banks make this decision.

   c. Banks hold fewer total reserves (rr falls) by lending more funds, which increases the money supply. Banks make this decision.

   d. When individuals hold less currency (c falls), their checking deposits rise, which pushes up the money supply. Individuals make this decision.

6. *Use the information below to answer the following questions:*

Currency	*$1,750*
Reserves-to-checking deposit ratio	*0.25*
Money supply	*$8,750*

a. *Calculate checkable deposits.*

$$M^S = Curr + ChD$$
$$8{,}750 = 1{,}750 + ChD$$
$$ChD = \$7{,}000$$

b. *Compute total reserves.*

$$TR = rr \times ChD$$
$$TR = 0.25 \times 7{,}000$$
$$TR = \$1{,}750$$

c. *Determine the monetary base.*

$$M^B = Curr + TR$$
$$M^B = 1{,}750 + 1{,}750$$
$$M^B = \$3{,}500$$

d. *Calculate the money multiplier.*

$$m = M^S/M^B$$
$$m = 8{,}750/3{,}500$$
$$m = 2.5$$

7. *Name and briefly describe the three conventional tools of monetary policy. Which one is the primary tool of monetary policy? How does the interest rate on reserves enable the Fed to raise the federal funds rate without selling a large amount of assets?*

   a. Open market operations occur when the Fed buys (sells) marketable securities (primarily U.S. Treasuries) in order in increase (decrease) the supply of reserves in the banking system. This policy action is the primary tool of the Fed.

   b. The Discount rate is the interest rate the Fed charges member banks from borrowing directly from the Fed's discount window.

c. Interest rate on reserves is the interest rate the Fed pays banks for holding reserves. By increasing the interest rate on reserves, the Fed can raise its federal funds rate target without causing banks to reduce their demand for reserves. With the demand for reserves constant, the Fed does not need to pull reserves out of the banking system by selling a large amount of its assets.

8. *Briefly explain the three general types of unconventional monetary policy that were discussed in class.*

   a. Programs to provide liquidity to the financial market are designed to prevent the financial system from seizing up and the resulting large declines in investment and output.

   b. Large-scale asset purchase programs involve the Fed purchasing long-term assets by issuing additional reserves in order to help lower long-term interest rates.

   c. Forward guidance occurs when the Fed commits to specific future policy actions.

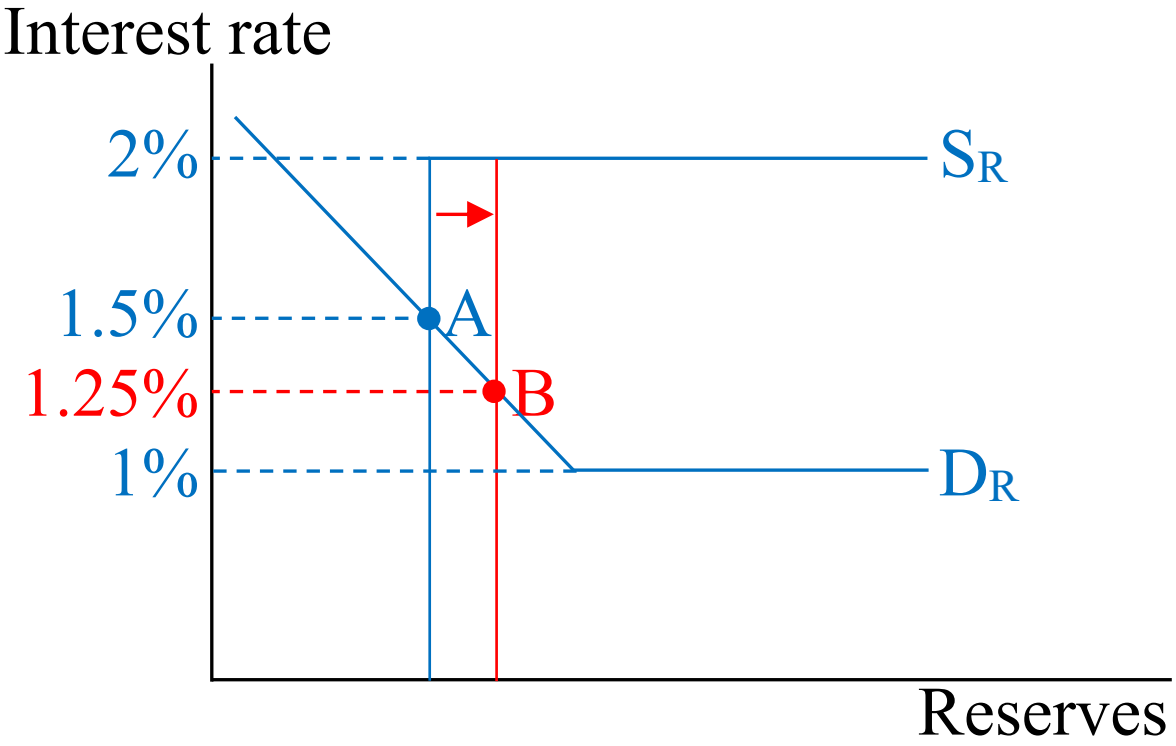
9. *What is the time-inconsistency problem? Describe the specific time-inconsistency problem that central banks face.*

   The time-inconsistency problem that central banks face is that their short-run goals of higher output does not line up with their long-run goals of low inflation, so central banks have a tendency to abandon their long-run inflation goals.

10. *For each part below, initially assume the federal funds rate trades at 1.5%, the interest rate paid on reserves is set to 1.0%, and the discount rate equals 2.0%. Show how each of the following monetary policy changes impacts the market for reserves. In your answer, include a graph for reserves that shows the market before and after each change. Be sure to properly show and label any kinks in the demand and supply curves for reserves.*

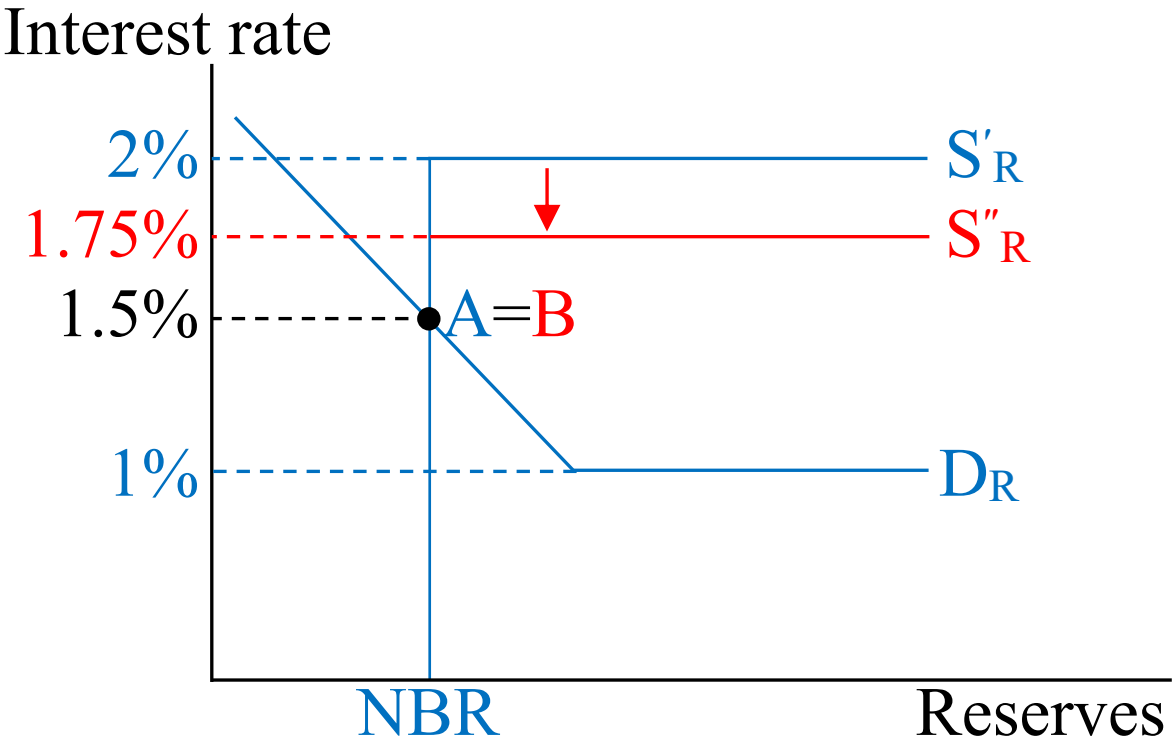
a. *The Fed increases nonborrowed reserves until the federal funds rate trades at 1.25%.*

When federal funds rate is greater than the discount rate, an open market purchase shifts the reserves supply curve rightward and the federal funds rate falls.



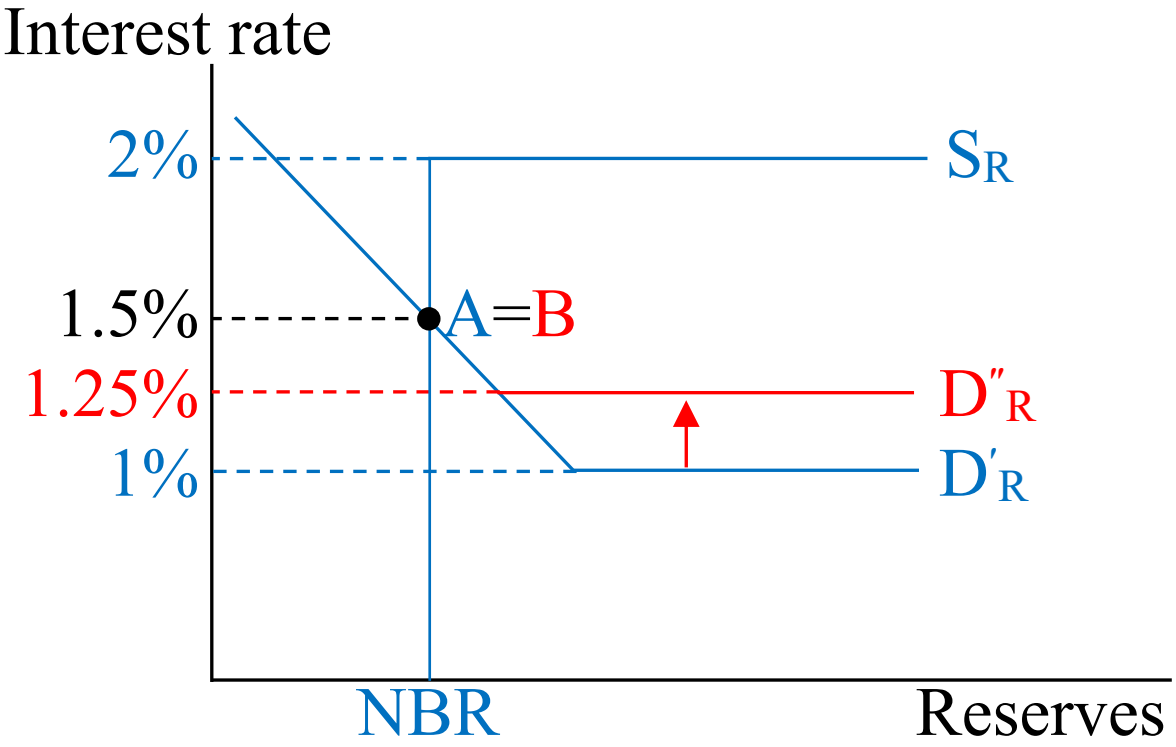
b. *The Fed lowers the discount rate to 1.75%.*

When Fed lowers the discount rate to 1.75%, the reserves supply curve shifts downward, but the federal funds rate remains at 1.5%.



c. *The Fed raises the interest rate on reserves to 1.25%.*

When Fed raises the interest rate on reserves to 1.25%, the reserves demand curve shifts upward, but the federal funds rate remains at 1.5%.



11. *What are differences between a hierarchical mandate and a dual mandate. Which type of mandate do the Federal Reserve and European Central Bank have?*

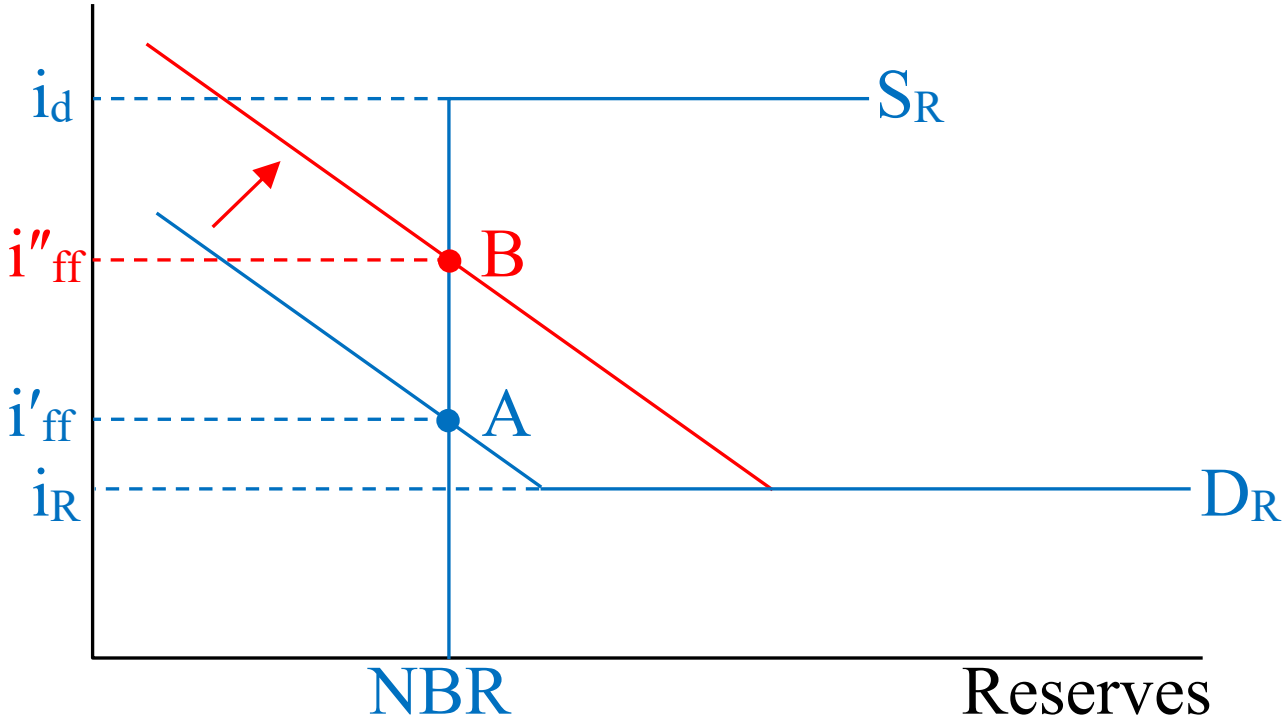
    a. A hierarchical mandate defines price stability as the primary goal with other mandates, such as output stability, as the secondary goal, so long as price stability is achieved. The European Central Bank has a hierarchical mandate.

    b. A dual mandate makes price stability and output stability coequal objectives. The Federal Reserve has a dual mandate.

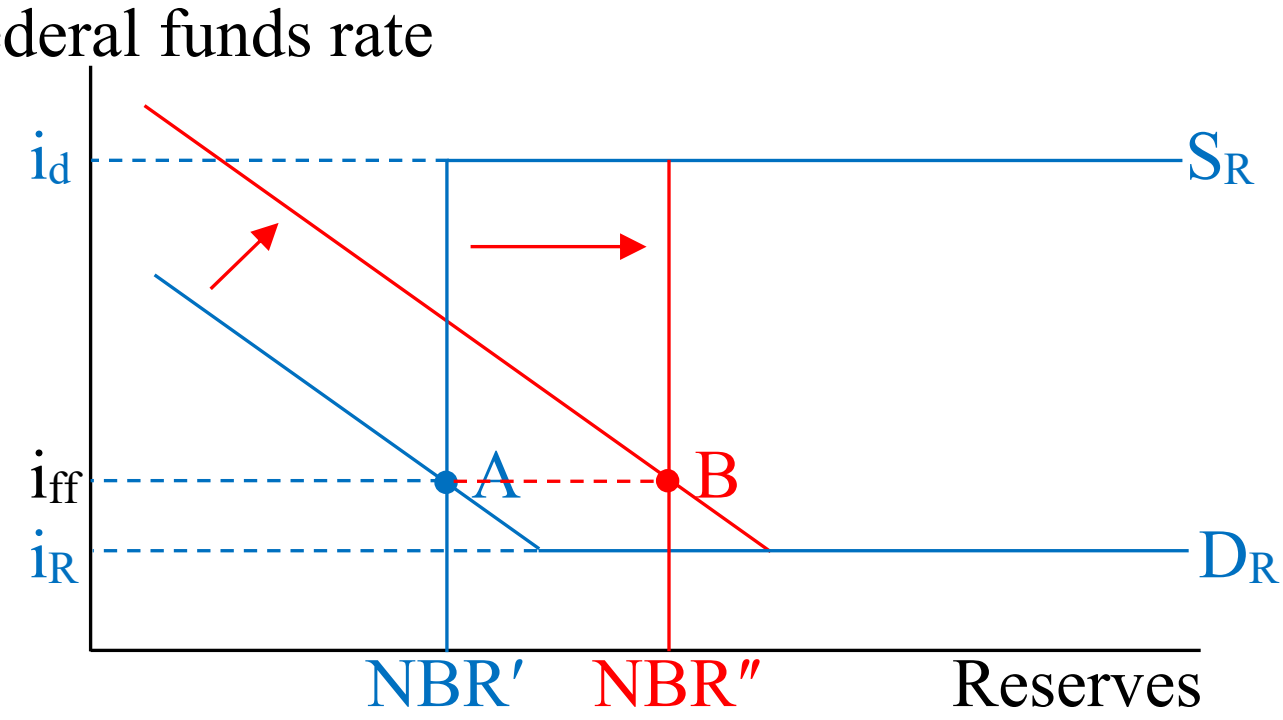
12. *What are the two policy instruments of a central bank? How does targeting each instrument affect the market for reserves.*

    The two policy instruments are a reserves target and an interest rate target.

A. A reserves target will lead to interest rate fluctuations. If the central bank targets nonborrowed reserves, then an increase in the demand for reserves will push up the interest rate.



B. An interest rate target will lead to fluctuations in reserves. If the central bank targets the federal funds rate, then the bank will increase nonborrowed reserves in response to an increase in the demand for reserves, so the interest rate will remain at its target.



13. *Define and briefly explain the Taylor Rule.*

The Taylor rule is a rule for setting a federal funds rate target where the federal funds rate target increases as inflation and the output gap rise:

$$R = r + \pi + 0.5\times(\pi - \pi^*) + 0.5\times[(Y - Y^*)/Y^*],$$

where
R is the federal funds rate target,
r is the equilibrium real federal funds rate,
π is the actual inflation rate,
π^* is the target inflation rate,
$(Y-Y^*)/Y^*$ is the percent deviation of output from its potential.

14. *Suppose nominal GDP is $16 trillion, the money supply is $6 trillion, and the inflation rate is 10%. Calculate the velocity of money.*

Set the velocity of money to V, nominal GDP to $P \times Y$ is nominal GDP and the nominal money supply to M^S.

$$V = P \times Y / M^S$$
$$V = \$16 \text{ trillion} / \$6 \text{ trillion}$$
$$V = 2.67$$

15. *According to the classical quantity theory of money, if money velocity is constant, the output growth rate is 2.5%, and the money supply growth rate is 6%, then how much is the inflation rate?*

The classical equation of exchange is

$$\%\Delta M^S + \%\Delta \overline{V} = \%\Delta P + \%\Delta Y$$
$$0.06 + 0.00 = \%\Delta P + 0.025$$
$$\Pi = \%\Delta P = 0.035 = 3.5\%$$

16. *Briefly explain how the classical quantity theory of money and the Keynesian theory of money demand differ in their assumptions regarding the impact of the nominal interest rate on the velocity of money. Are the short-run and long-run empirical evidence consistent with the classical quantity theory of money or the Keynesian theory of money demand?*

    The classical quantity theory of money assumes nominal interest rates and money velocity have no effects on money demand. The Keynesian theory of money demand assumes higher nominal interest rates raise money velocity which reduces the demand for money. The classical theory is more consistent with long-run empirical evidence while the Keynesian theory is more consistent with short-run empirical evidence.

17. *State the two ways a government can finance a budget deficit. What is meant when it is said the government is "monetizing the debt." What is the most noticeable economic effect when the government "monetizes the debt?"*

    The government can finance its deficit by 1) increasing the government bonds held by the public 2) increasing the monetary base. Governments that are "monetizing the debt" are financing their budget deficits by increasing their monetary base and money supply. The most noticeable economic effect of "monetizing the debt" is sustained higher levels of inflation.

18. *Name and briefly discuss the six factors that impact the demand for money.*

    a. Higher income leads to more transactions, which raises the demand for money.

    b. Higher interest rates increase the opportunity cost of holding money, which reduces the demand for money.

    c. Improved payment technology reduces the need for money, which lowers the demand for money.

    d. An increase in the riskiness of other assets makes money more attractive, which raises the demand for money.

    e. A higher inflation risk makes money riskier, which reduces the demand for money.

f. As the liquidity of other assets rises, money is a less attractive instrument to hold wealth, which lowers the demand for money.

19. *What are the six factors that shift the IS and AD curves to the right.*

a. An increase in autonomous consumption ($\bar{C}$) [$\bar{C}\uparrow \rightarrow Y\uparrow$]

b. An increase in autonomous investment ($\bar{I}$) [$\bar{I}\uparrow \rightarrow Y\uparrow$]

c. An increase in government spending ($\bar{G}$) [$\bar{G}\uparrow \rightarrow Y\uparrow$]

d. A decrease in taxes ($\bar{T}$) [$T\downarrow \rightarrow Y^{D}\uparrow \rightarrow C\uparrow \rightarrow Y\uparrow$]

e. An increase in auto. net exports ($\overline{NX}$) [$\overline{NX}\uparrow \rightarrow Y\uparrow$]

f. A decrease in financial frictions ($\bar{f}$) [$\bar{f}\downarrow \rightarrow I\uparrow \rightarrow Y\uparrow$]

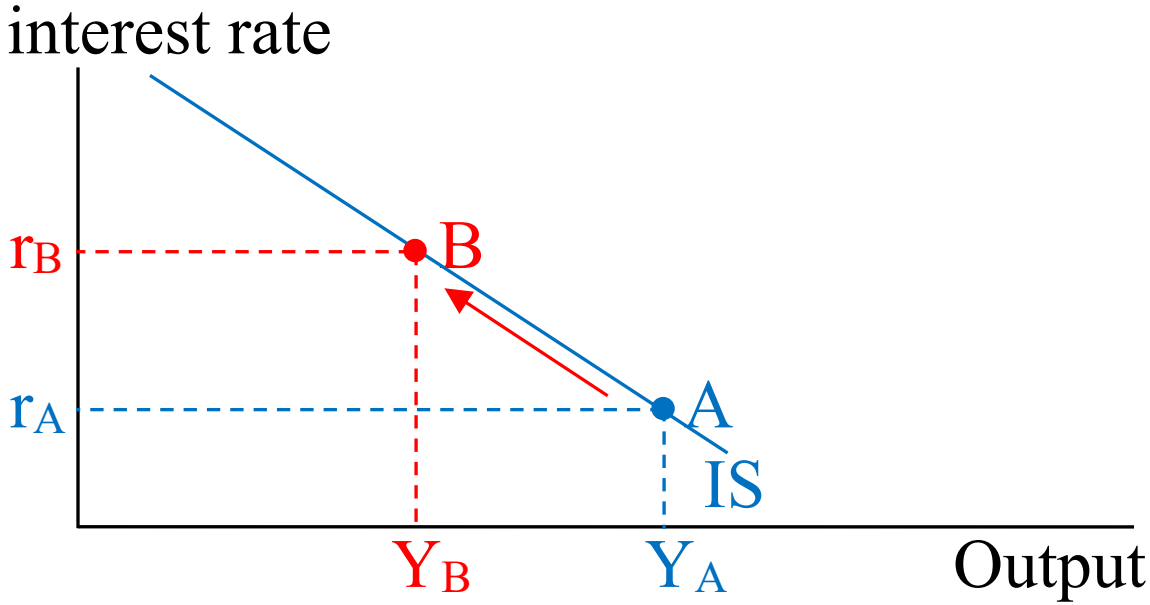
20. *What are the two factors that shift the MP curve down and the AD curve to the right?*

    a. A decrease in the autonomous real interest rate ($\bar{r}$)
    $[\bar{r}\downarrow \rightarrow r\downarrow \rightarrow (I\uparrow \ \& \ NX\uparrow) \rightarrow Y\uparrow]$

    b. An increase in the target inflation rate (π^*)
    $[\pi^*\uparrow \rightarrow r\downarrow \rightarrow (I\uparrow \ \& \ NX\uparrow) \rightarrow Y\uparrow]$

21. *Use an IS curve graph to show the short-run impact of an increase in the real interest rate in the goods market. Include a brief explanation in your answer and be sure to properly label your graph.*

A higher real interest rate reduces investment and net exports, which pushes down output. [r↑ → (I↓ & NX↓) → Y↓] Thus, the IS curve is downward sloping.



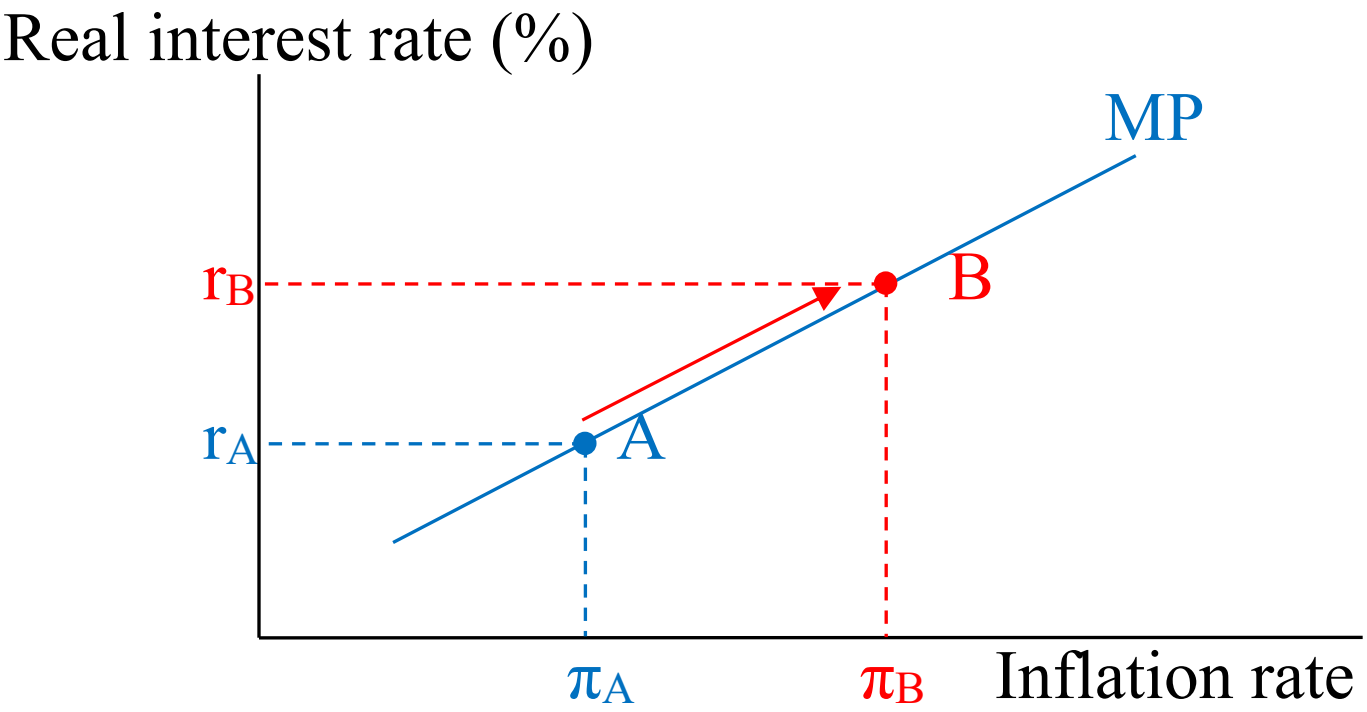
22. *Assume monetary policy utilizes the following rule:* $R = \bar{r} + \pi + \theta \times (\pi - \pi^*)$. *Use the Fischer equation, assuming* $\pi = \pi^e$, *to derive the monetary policy curve equation and then graph that curve. What is the Taylor Principle and how does it relate the inflation rate to the real interest rate?*

If $\pi = \pi^e$, we can substitute the Fisher equation, $R = r + \pi$, into the policy rule to get the equation for the MP curve

$$r + \pi = \bar{r} + \pi + \theta \times (\pi - \pi^*)$$

$$r = \bar{r} + \theta \times (\pi - \pi^*)$$

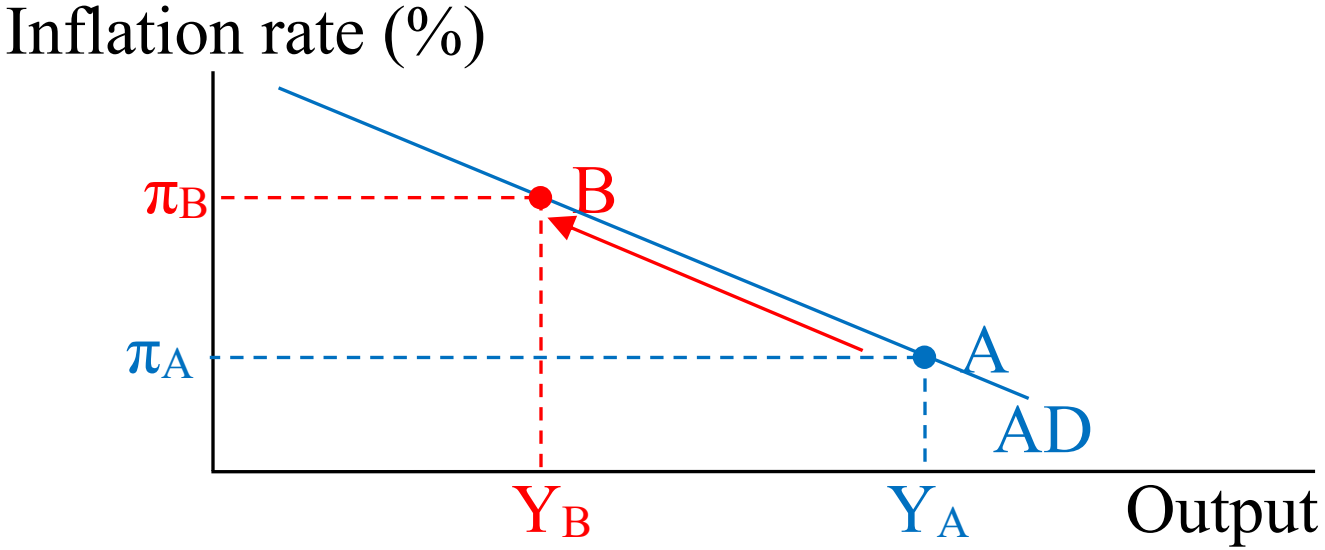
[$\pi\uparrow \rightarrow R\uparrow \rightarrow r\uparrow$]



The Taylor principle says the central bank should respond to a rise in the inflation rate by pushing up the nominal interest rate enough so that the real interest rate increases. Since $\theta > 0$, the Taylor principle holds for the MP curve.

23. *Use an AD curve graph to show the short-run impact of an increase in the inflation rate on output. (Focus on the demand side of the market.) Include a brief explanation in your answer and be sure to properly label your graph.*

Higher inflation is represented by an upward movement along the AD curve. [$\pi\uparrow \rightarrow R\uparrow \rightarrow r\uparrow \rightarrow (I\downarrow \text{ \& } NX\downarrow) \rightarrow Y\downarrow$]



24. *Suppose the following equations describe the economy:*

$$Y = C + I + G + NX,$$
$$C = 210 + 0.8 \times (Y - 700),$$
$$I = 725 - 4{,}000 \times r,$$
$$G = 650,$$
$$NX = 95 - 6{,}000 \times r,$$
$$R = 0.025 + \pi + 0.5 \times (\pi - 0.02),$$
$$R = r + \pi,$$
$$\pi = 0.02 + 0.4 \times (Y - 4{,}000)/4{,}000,$$

where Y is output, C is consumption, I is investment, G is government spending, NX is net exports, r is the real interest rate, R is the nominal interest rate, and π is the inflation rate.

a. *Derive the equation for the IS curve.*

Income identity: $Y = C + I + G + NX$

Consumption function: $C = 210 + 0.8 \times (Y - 700)$,

Investment function: $I = 725 - 4{,}000 \times r$,

Government spending: $G = 650$,

Net exports function: $NX = 95 - 6{,}000 \times r$,

$$Y = 210 + 0.8 \times (Y - 700) + 725 - 4{,}000 \times r + 650 + 95 - 6{,}000 \times r$$

$$Y = 210 - 560 + 725 + 650 + 95 + 0.8 \times Y - 4{,}000 \times r - 6{,}000 \times r$$

$$Y = 1{,}120 + 0.8 \times Y - 10{,}000 \times r$$

$$0.2 \times Y = 1{,}120 - 10{,}000 \times r$$

$$Y = 5{,}600 - 50{,}000 \times r$$

b. *Derive the equation for the monetary policy curve.*

Monetary policy rule: $R = 0.025 + \pi + 0.5\times(\pi - 0.02)$

Fischer equation: $R = r + \pi$,

$$r + \pi = 0.025 + \pi + 0.5\times(\pi - 0.02)$$
$$r = 0.025 + 0.5\times\pi - 0.01$$
$$r = 0.015 + 0.5\times\pi$$

c. *Derive the equation for the aggregate demand curve.*

IS curve: $Y = 5{,}600 - 50{,}000\times r$

MP curve: $r = 0.015 + 0.5\times\pi$

$$Y = 5{,}600 - 50{,}000\times(0.015 + 0.5\times\pi)$$
$$Y = 5{,}600 - 750 - 25{,}000\times\pi$$
$$Y = 4{,}850 - 25{,}000\times\pi$$

d. *Calculate equilibrium output, inflation rate, real interest rate, and nominal interest rate.*

$$\text{AD curve: } Y = 4{,}850 - 25{,}000 \times \pi$$
$$\text{AS curve: } \pi = 0.02 + 0.4 \times (Y - 4{,}000)/4{,}000$$

$$\pi = 0.02 + 0.4 \times (Y - 4{,}000)/4{,}000$$
$$\pi = 0.02 + (Y - 4{,}000)/10{,}000$$
$$10{,}000 \times \pi = 200 + Y - 4{,}000$$
$$Y = 10{,}000 \times \pi + 3{,}800$$

$$4{,}850 - 25{,}000 \times \pi = 10{,}000 \times \pi + 3{,}800$$
$$35{,}000 \times \pi = 1{,}050$$
$$\pi = 1{,}050/35{,}000$$
$$\pi = 0.03$$

$$Y = 4{,}850 - 25{,}000 \times (0.03)$$
$$Y = 4{,}850 - 750$$
$$Y = 4{,}100$$

MP curve: $r = 0.015 + 0.5 \times \pi$

Fisher equation: $R = r + \pi$

$$r = 0.015 + 0.5 \times 0.03$$
$$r = 0.015 + 0.015$$
$$r = 0.03$$

$$R = 0.03 + 0.03$$
$$R = 0.06$$

e. *Calculate equilibrium level of consumption, investment, and net exports.*

Consumption function: $C = 210 + 0.8\times(Y - 700)$,
Investment function: $I = 725 - 4{,}000\times r$,
Net exports function: $NX = 95 - 6{,}000\times r$,

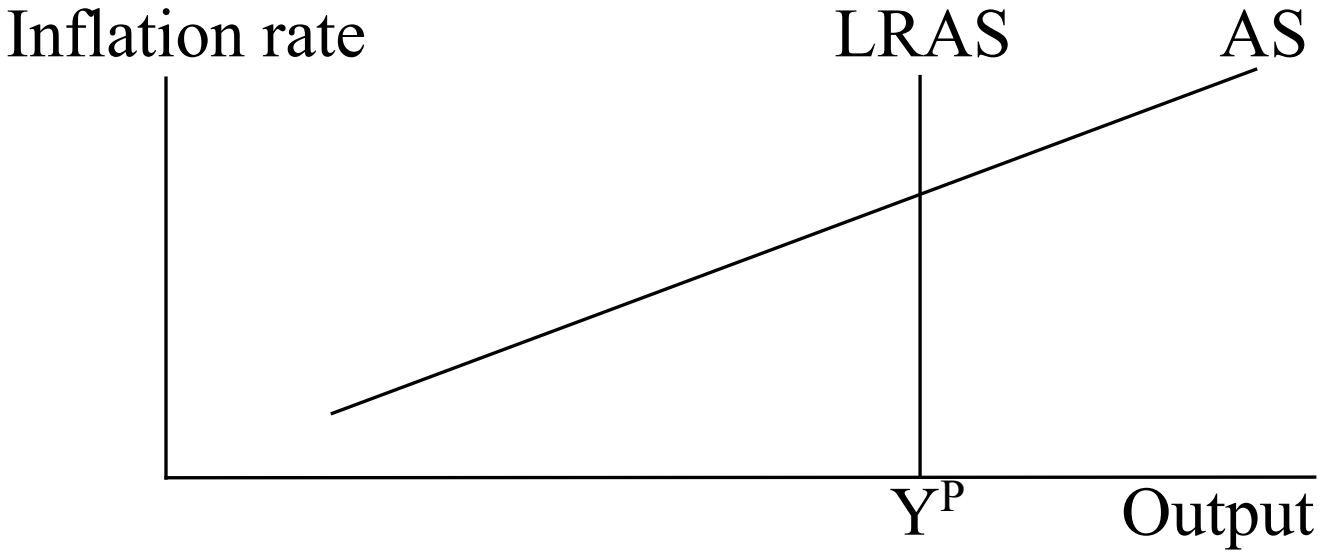
$$C = 210 + 0.8\times(4{,}100 - 700)$$
$$C = 210 + 2{,}720$$
$$C = 2{,}930$$

$$I = 725 - 4{,}000\times 0.03$$
$$I = 725 - 120$$
$$I = 605$$

$$NX = 95 - 6{,}000\times 0.03$$
$$NX = 95 - 180 = -85$$

25. *Graph the short-run and long-run aggregate supply curves. Briefly explain why each curve has the shape it does.*

The long-run aggregate supply (LRAS) curve is vertical because prices and wages are flexible in the long run. The short-run aggregate supply (AS) curve is upward sloping because prices and wages are sticky in the short run.



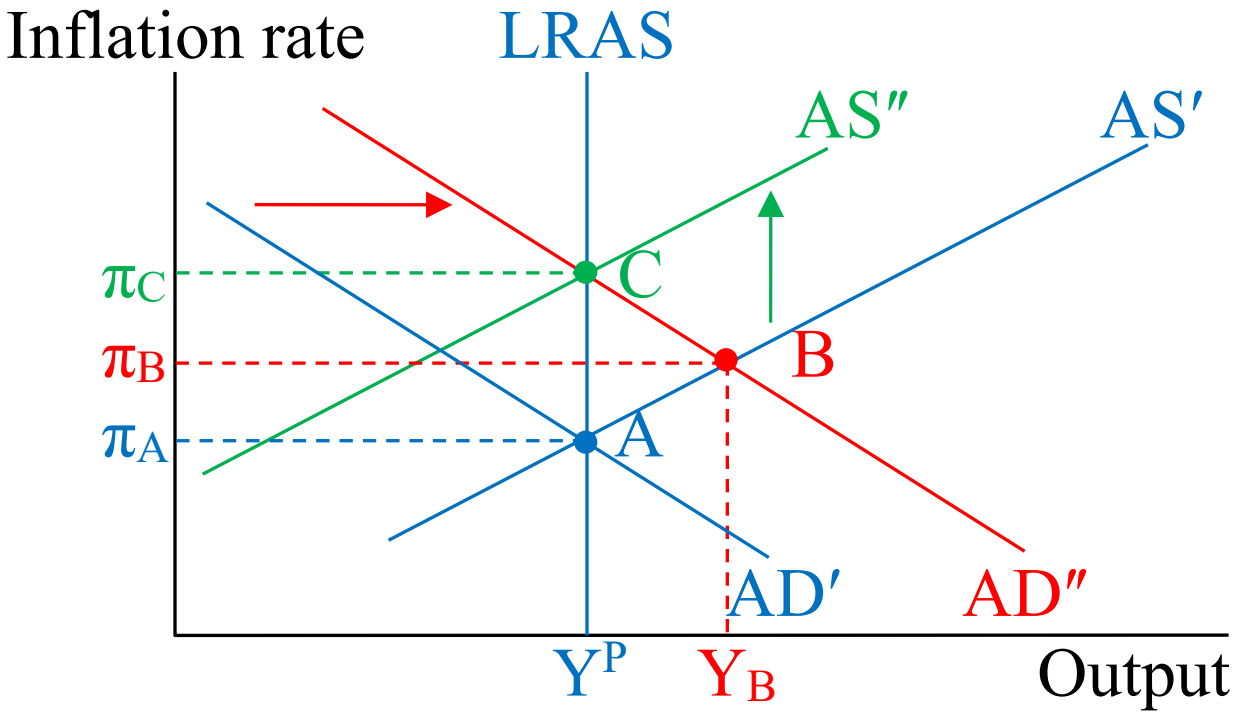
26. *Use an AD/AS curve graph to explain how each of the following impacts output and inflation in the short run and the long run.*

    a. *An increase in autonomous consumption.*

        1. In the short run, a rise in autonomous consumption raises output which is represented by a rightward shift in the AD curve. The resulting positive output gap causes inflation to rise, which leads to an upward movement along the AS curve [$\bar{C}\uparrow \rightarrow Y\uparrow \rightarrow (Y-Y^P)\uparrow \rightarrow \pi\uparrow$]. Thus, the economy moves to point B where inflation and output are higher.

        2. In the long run, the higher inflation raises inflation expectations, which causes inflation to increase more and the AS curve to shift left. The central

bank responds to the higher inflation by pushing up the nominal and real interest rates. The higher real interest rate reduces investment and net exports which lowers output [$(\pi > \pi^e) \rightarrow \pi^e\uparrow \rightarrow \pi\uparrow \rightarrow r\uparrow \rightarrow (I\downarrow$ & $NX\downarrow) \rightarrow Y\downarrow$]. Thus, the economy moves to point C, output returns to potential, and inflation rises.

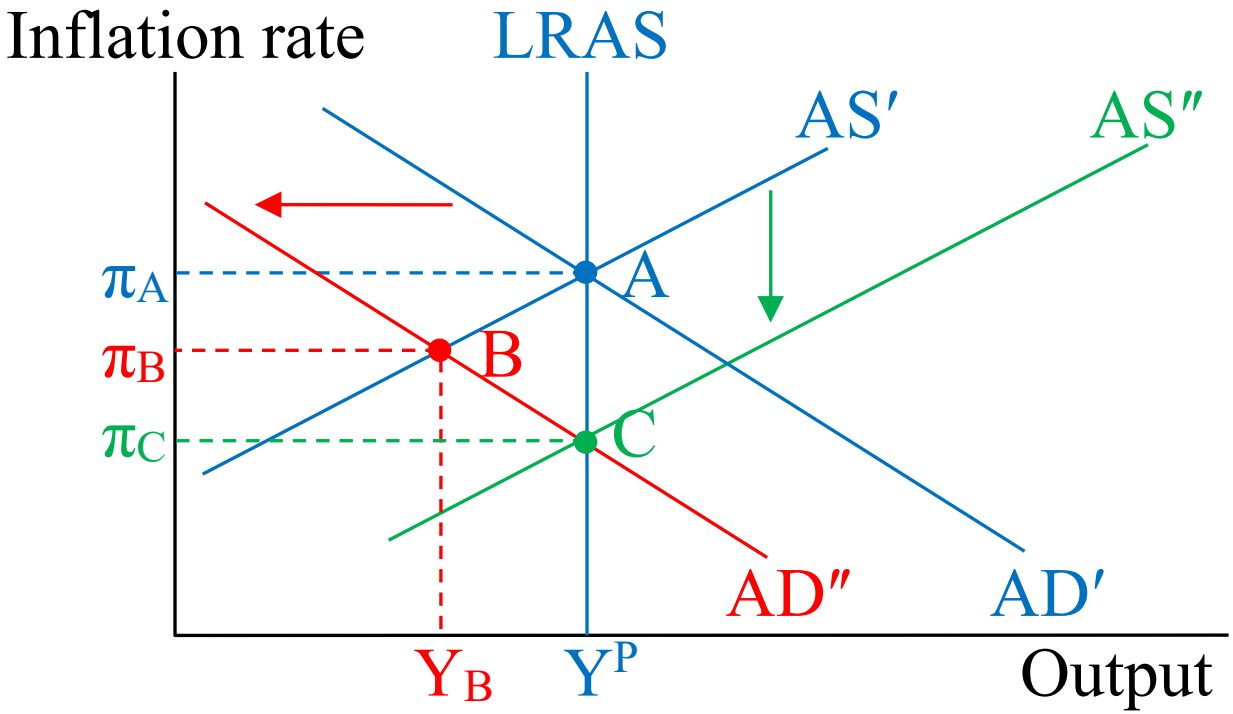


b. *An increase in financial frictions.*

1. In the short run, an increase in financial frictions lowers autonomous investment and output. That decline in output is represented by a leftward shift in the AD curve. The resulting negative output gap causes inflation to fall [$\bar{f}\uparrow \rightarrow Y\downarrow \rightarrow (Y - Y^P)\downarrow \rightarrow \pi\downarrow$] and leads to a downward movement along the AS curve. As a result, the economy moves to point B where inflation and output are lower.

2. In the long run, the decline in inflation puts downward pressure on inflation expectations which causes inflation to fall further and the AS curve to shift to the down and to the right. The lower inflation leads to the central bank to reduce the

nominal and real interest rates. The lower real interest rate stimulates investment and net exports which causes output to increase [$(\pi < \pi^e) \rightarrow \pi^e\downarrow \rightarrow \pi\downarrow \rightarrow r\downarrow \rightarrow (I\uparrow \text{ \& } NX\uparrow) \rightarrow Y\uparrow$]. Thus, the economy moves to point C, output returns to potential, and inflation declines.

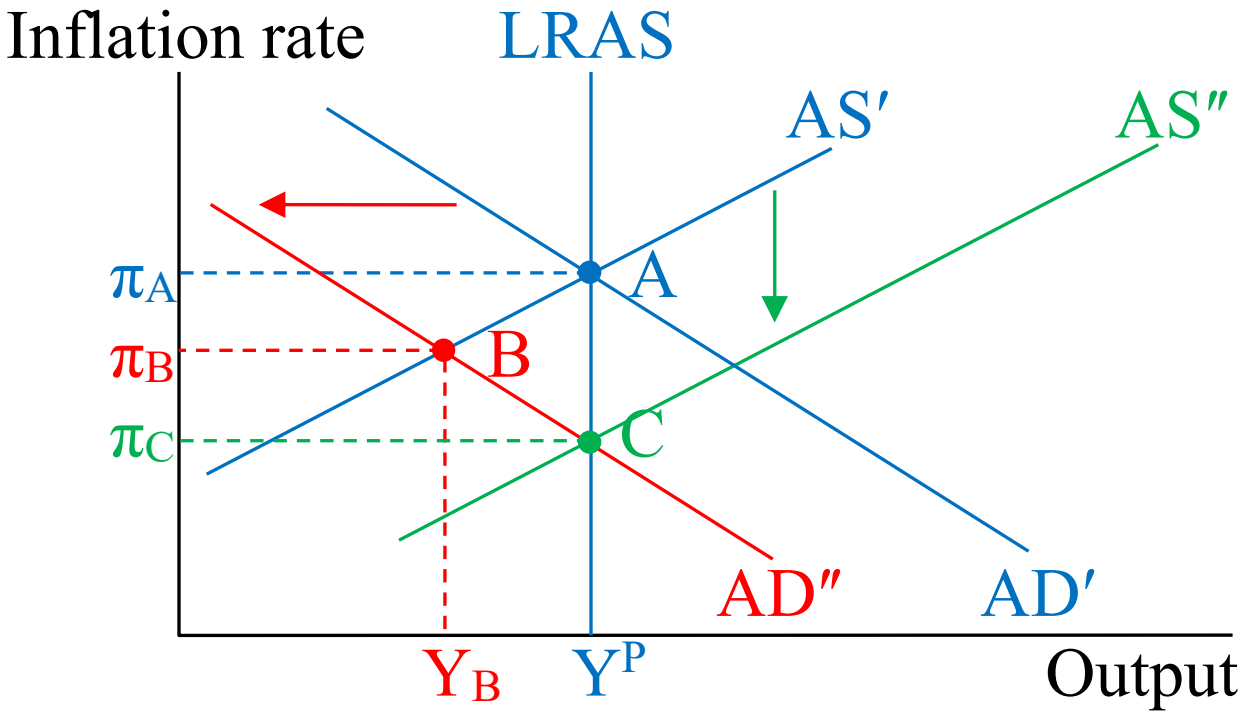


c. *An increase in the autonomous real interest rate.*

1. In the short run, an increase the autonomous real interest rate leads the central bank to raise nominal and real interest rates. The higher real interest rate lowers investment and net exports causing output to fall and the AD curve to shift left. The resulting negative output gap causes inflation to fall [$\bar{r}\uparrow \rightarrow r\uparrow \rightarrow (I\downarrow \text{ \& } NX\downarrow) \rightarrow Y\downarrow \rightarrow (Y-Y^P)\downarrow \rightarrow \pi\downarrow$] and leads to a downward movement along the AS curve. Thus, the economy moves to point B where inflation and output are lower.

2. In the long run, the decline in inflation reduced inflation expectations which causes inflation to fall further and the AS curve to shift to the down. The

lower inflation leads to the central bank to reduce the nominal and real interest rates. The lower real rate stimulates investment and net exports which increases output [($\pi < \pi^e$)$\rightarrow\pi^e\downarrow\rightarrow\pi\downarrow\rightarrow$r$\downarrow\rightarrow$(I$\uparrow$ & NX$\uparrow$)$\rightarrow$Y$\uparrow$]. Thus, the economy moves to point C, output returns to potential, and inflation declines.

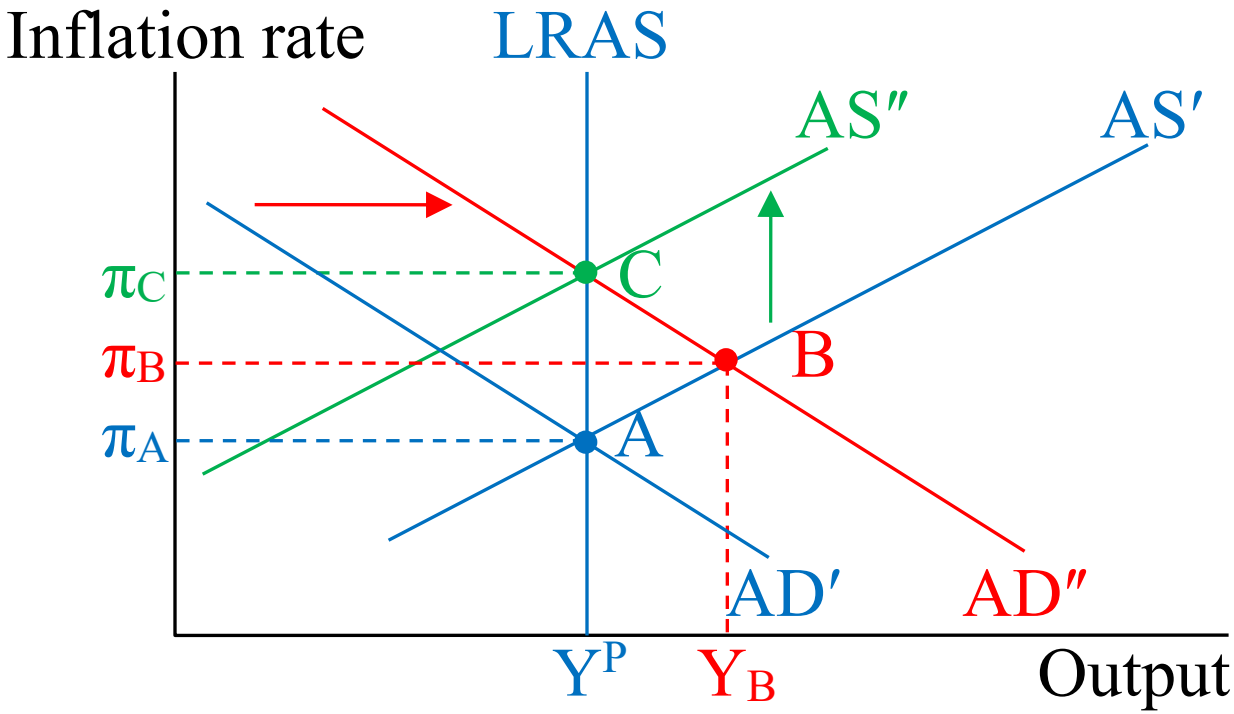


d. *An increase in the central bank's inflation target.*

1. In the short run, an increase the target inflation rate leads the central bank to reduce the nominal and real interest rates. The lower real interest rate raises investment and net exports which pushes up output shifts the AD curve to the right. The resulting positive output gap causes inflation to rise [$\pi^{*}\uparrow \rightarrow r\downarrow \rightarrow (I\uparrow \ \& \ NX\uparrow) \rightarrow Y\uparrow \rightarrow (Y - Y^{P})\uparrow \rightarrow \pi\uparrow$] and leads to an upward movement along the AS curve. Thus, the economy moves to point B where inflation and output are higher.

2. In the long run, the higher inflation raises inflation expectations which further increases inflation and shifts the AS curve left. The central bank responds

to more inflation by raising the nominal and real interest rates. That jump in the real interest rate pushes down investment and net exports which causes output to fall [$(\pi > \pi^e) \rightarrow \pi^e\uparrow \rightarrow \pi\uparrow \rightarrow r\uparrow \rightarrow (I\downarrow$ & $NX\downarrow) \rightarrow Y\downarrow$]. Thus, the economy moves to point C, output returns to potential, and inflation rises.

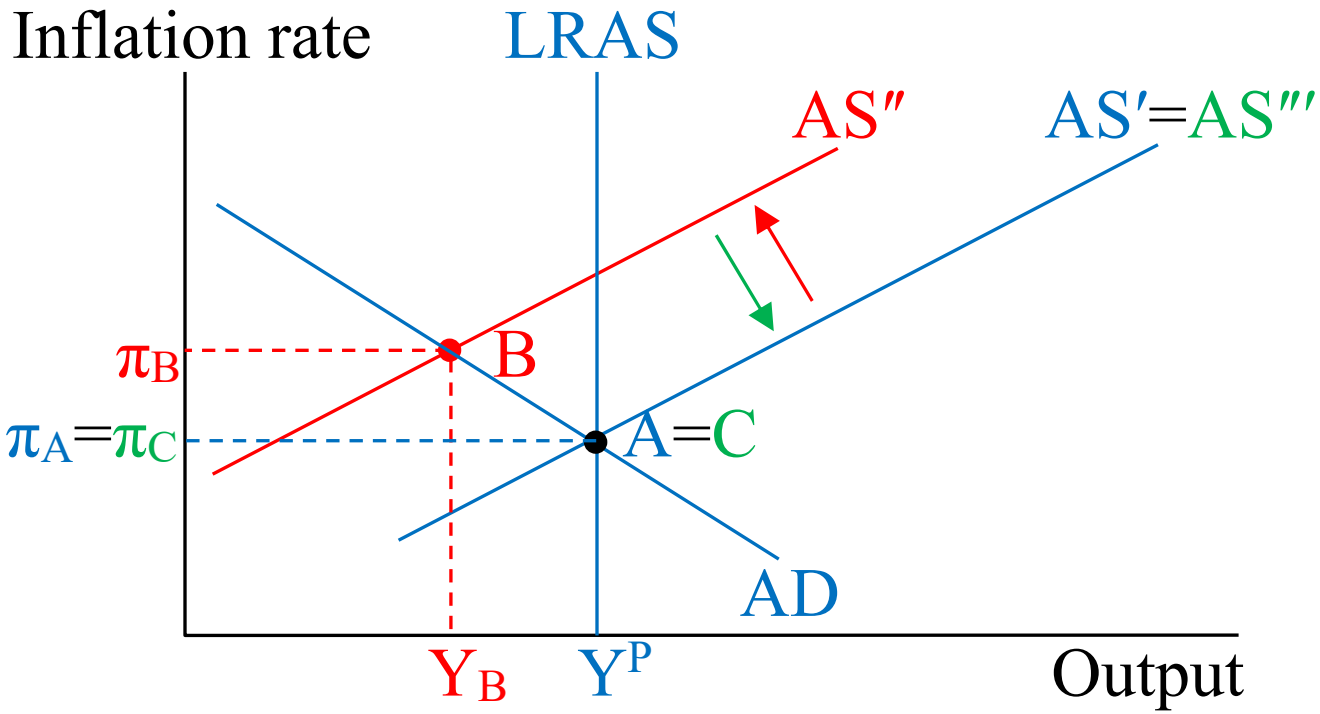


e. *An increase in the expected inflation rate.*

1. In the short run, an increase in the expected inflation rate pushes up actual inflation which causes the central bank to raise nominal and real interest rates. A higher real interest rate depresses investment and net exports leading to a decline in output [($\pi^e\uparrow \rightarrow \pi\uparrow \rightarrow r\uparrow \rightarrow (I\downarrow$ & $NX\downarrow) \rightarrow Y\downarrow$]. Those changes are represented by a leftward shift in the AS curve. Thus, the economy moves to point B where inflation is higher, and output is lower.

2. In the long run, the negative output gap pushes do inflation which leads the central bank to decrease the nominal and real interest rates. The lower real interest rate stimulates investment and net exports

which pushes up output [$(Y-Y^P)\downarrow \rightarrow \pi\downarrow \rightarrow r\downarrow \rightarrow (I\uparrow$ & $NX\uparrow) \rightarrow Y\uparrow$]. Those changes are represented by a rightward shift in the AS curve such that the economy moves back to point A (or point C). Thus, output returns to potential, and inflation returns to its original level.



f. *An increase in potential output.*

1. In the short run, a rise in potential output reduces the output gap which pushes down inflation. The drop in inflation leads the central bank to reduce nominal and real interest rates. A lower real interest rate pushes up investment and net exports leading to a jump in output [$Y^P\uparrow \rightarrow (Y < Y^P) \rightarrow \pi\downarrow \rightarrow r\downarrow \rightarrow (I\uparrow$ & $NX\uparrow) \rightarrow Y\uparrow$]. Those changes cause both the LRAS and AS curves to shift right. Thus, the economy moves to point B where inflation is lower, and output is higher.

2. In the long run, the negative output gap continues to push down inflation which leads the central bank to reduce the nominal and real interest rates. The

lower real interest rate stimulates investment and net exports which pushes up output [$(Y < Y^P) \rightarrow \pi\downarrow \rightarrow r\downarrow \rightarrow (I\uparrow \text{ \& } NX\uparrow) \rightarrow Y\uparrow$]. Those changes lead the AS curve to shift right so that the economy moves to point C. Thus, output shifts to the higher level of potential output while inflation falls.